REMARKS

Administrative Overview

The Office action dated August 13, 2004, examined claims 39-83. The Office action rejected claims 39-83 under 35 U.S.C. § 102(e) as being anticipated by Jacobus et al., U.S. Patent Number 5,629,594 (*Jacobus*).

Claims 39-83 are currently pending. Applicants hereby amend claims 39, 60 and 61 as reflected in the Listing of Claims. Support for these amendments may be found in the application as originally filed, for example, on page 6 line 22 to page 7 line 26 of the specification. In view of these amendments and the following remarks, Applicants request reconsideration and withdrawal of the rejections, and allowance of claims 39-83 in due course.

Applicants Request Consideration of the Information Disclosure Statement Received by the Patent Office on 7/31/02

The Office action indicates that the Information Disclosure Statement (IDS) received by the Patent Office on 07/31/02 was not considered, alleging that the IDS fails to comply with 37 C.F.R. § 1.98(a)(2), requiring a legible copy of each U.S. and foreign patent listed, along with a copy of all publications listed. Applicants respectfully disagree that the IDS fails to comply, noting that 37 C.F.R. § 1.98(d) is an exception to the copy requirement.

As required by 37 C.F.R. § 1.98(d), the IDS specifically identifies the parent case. The IDS states on page 1, "[C]opies of the references cited are not enclosed because they have been previously cited by Applicants in the parent U.S. Patent application serial no. 09/324,137 provided under 37 C.F.R. § 1.98(d) and M.P.E.P. 609(2)." Furthermore, all of the references cited in the accompanying Form PTO-1449 were cited in the parent case and are listed in the "References Cited" section of the patent that issued from the parent application, U.S. Pat. No. 6,369,834. As such, Applicants respectfully submit that the Information Disclosure Statement filed on 07/15/02, received by the Patent Office on 7/31/02, is in compliance with 37 C.F.R. § 1.98, and therefore all references, including "B" and "C" references, should be considered.

Applicants are pleased to provide additional copies of the "B" and "C" references herewith for the convenience of the Examiner. Applicants respectfully request that the cited documents of this IDS, including the "B" and "C" documents listed on sheets 4-6 of the accompanying Form PTO-1449, be considered and that initialed Form PTO-1449 sheets be entered in the file. The Examiner is invited to contact the undersigned for any additional information.

Applicants Amend Abstract so as Not to Exceed 150 Words in Length

The abstract is objected to for exceeding 150 words. The Abstract is hereby amended so as not to exceed 150 words, as reflected in the Amendments to the Specification. Applicants request that the objection be withdrawn.

Claims 39 and 60 are not Anticipated by *Jacobus*

Claims 39 and 60 stand rejected under 35 U.S.C. § 102(e) as being anticipated by U.S. Patent No. 5,629,594 to Jacobus *et al.* (*Jacobus*). Applicants respectfully traverse these rejections.

Applicants amend claims 39 and 60 to further distinguish from the cited art. Claims 39 and 60 relate to a method and system, respectively, for determining force to be applied to a user through a haptic interface. Each of claims 39 and 60, as presently amended, recites determining two locations: (1) a haptic interface location in response to the position of a user; and (2) a fiducial object location on the surface of a virtual object. A force is calculated in response to locations (1) and (2). Location (1) is a haptic interface location, which describes a position of the user in the virtual environment. Location (2) is a fiducial object location.

The specification at page 6 line 28 to page 7 line 2 explains location (2), the fiducial object location, as follows:

> The fiducial object location represents the location in graphic space at which the haptic interface would be located if the haptic interface could be prevented from penetrating the virtual objects. The fiducial object does not penetrate the surfaces of the virtual objects.

The specification at page 7 lines 20-24 explains:

> Forcing the fiducial object to remain on the surface of the virtual object allows for a more realistic generation of the forces arising from interacting with the virtual object. Unlike in the vector field methods, the direction of the force to be applied to the user in real space is unambiguous. The user is not "pulled" through an object when the user should continue to be "pushed" away from the object.

This method provides a more realistic haptic experience for the user. For example, in one embodiment, a force is calculated that is proportional to the distance between the fiducial object location and the haptic interface location. This force is then applied to the user. Thus, the further the user penetrates the surface of a virtual object, the greater the resistance to further penetration he experiences.

In contrast, *Jacobus* does not teach or disclose a fiducial object located on the surface of a virtual object. The Office action cites column 2 lines 55-65 of *Jacobus* as support for the allegation that *Jacobus* discloses the limitation, "determining a fiducial object location and calculating a force to be applied to the user in response to the haptic interface location and the

fiducial object location". Applicants respectfully disagree with this allegation. The cited portion of *Jacobus* states:

> A general object of the present invention is to provide a tactile virtual reality in response to a 5 user input. According to the present invention, an electric signal is generated for each of a plurality of degrees of freedom of the user as a function of the user position and orientation in three-dimensional space. At least one virtual reality force field is generated in response to the generated signals. A fourth signal is generated for each degree of freedom as a function of the force field, and a tactile force on the user is generated for each force signal.

The force field generated in *Jacobus* is simply, "a function of the user position and orientation in three-dimensional space." *Jacobus* does not teach or suggest applying a force that is a function of the location on the surface of a virtual object at which a haptic interface would be located if the haptic interface could be prevented from penetrating the virtual object.

Jacobus describes the implementation of a detent at column 10 line 17 to column 11 line 4, wherein a force is computed as a function of the distance, D, from the detent center, Xc, Yc. Unlike the fiducial object location of claims 39 and 60, the detent center of *Jacobus* is not located on the surface of a virtual object.

Therefore, because *Jacobus* does not teach or suggest all of the limitations of either of claims 39 or 60, as amended, claims 39 and 60 are patentable in light of *Jacobus*, and Applicants respectfully request reconsideration and withdrawal of the rejections under 35 U.S.C. § 102(e) of claims 39 and 60.

Dependent claims 40-58 and 61-81 are not Anticipated by *Jacobus*

Claims 40-58 and 61-81 each depend directly or indirectly on either independent claim 39 or 60, and as such, each include all the limitations of their respective parent claim. Thus, claims 40-58 and 61-81 are allowable for at least the reasons discussed above with respect to claims 39 and 60. Accordingly, Applicants respectfully request reconsideration and withdrawal of the rejections of dependent claims 40-58 and 61-81 under 35 U.S.C. § 102(e), at least on this basis.

Claim 59 is not Anticipated by *Jacobus*

Claim 59 stands rejected under 35 U.S.C. § 102(e) as being anticipated by *Jacobus*. Applicants respectfully traverse this rejection.

Claim 59 recites assigning state variables to a haptic interface location. Claim 59 further recites computing forces to be applied to a user based on previously stored state variables of the haptic interface location.

The specification at page 10 lines 21-26 explains as follows:

> After determining the locations of the haptic interface point and the fiducial object point, the haptic rendering application stores state variables representing these locations for later use in calculating the forces to be applied to the user. The purpose of storing information relating to these locations is to enable the haptic rendering application to compute the forces to be applied to the user based on the history of the user's motions.

Jacobus does not teach or suggest computing forces based on previously stored state variables of the haptic interface location, as recited in claim 59. The Office Action cites *Jacobus* at column 10 lines 25-50 as allegedly disclosing "computing forces to be applied to the user based on previously stored state variables of the haptic interface location. However, *Jacobus* at column 10 lines 25-50 appears to disclose mathematical equations for calculating a detent force based on the detent center location and "current hand controller joint coordinates X,Y," but *not* based on previously stored state variables. The joint coordinates X, Y in *Jacobus* are "current joint coordinates," and do not represent previously stored variables.

Thus, *Jacobus* does not teach or suggest all the limitations of claim 59. Accordingly, Applicants respectfully request reconsideration and withdrawal of the rejection of claim 59 under 35 U.S.C. § 102(e).

Claim 82 is not Anticipated by *Jacobus*

Claim 82 stands rejected under 35 U.S.C. § 102(e) as being anticipated by Jacobus. Applicants respectfully traverse this rejection.

Claim 82 recites a series of steps, including the step of defining an object in graphic space as a mesh of planar surfaces comprising nodes. *Jacobus* does not teach or suggest this limitation. The Office action cites Figure 6 as support for this limitation; however, Figure 6 shows a manipulator, a mechanical device described in *Jacobus*. This is not a virtual object and does not serve as support for the allegation of the Office action against claim 82.

Additionally, claim 82 recites calculating the magnitude of a damping force by associating a damping coefficient with nodes of the planar surfaces, determining on which planar surfaces the fiducial object is located, and computing a damping coefficient by interpolating the damping coefficients associated with the nodes of each planar surface on which the fiducial object is located.

While *Jacobus* at column 10 appears to disclose a damping factor, *Jacobus* does not teach or suggest associating damping coefficients with nodes of planar surfaces as recited in claim 82. Thus, *Jacobus* does not teach or disclose all the limitations of claim 82, and as such, *Jacobus*

does not anticipate claim 82. Accordingly, Applicants respectfully request reconsideration and withdrawal of the rejection of claim 82 under 35 U.S.C. § 102(e).

Claim 83 is not Anticipated by *Jacobus*

Claim 83 stands rejected under 35 U.S.C. § 102(e) as being anticipated by *Jacobus*. Applicants respectfully traverse this rejection.

Claim 83 recites a series of steps, including a step of defining an object in graphic space as a mesh of planar surfaces comprising nodes. As described above with respect to claim 82, *Jacobus* does not teach or disclose this limitation.

Also as described above, *Jacobus* does not teach or suggest associating surface normals with nodes of planar surfaces as recited in claim 83. Thus, *Jacobus* does not teach or suggest all the limitations of claim 83, and as such, *Jacobus* does not anticipate claim 83. Accordingly, Applicants respectfully request reconsideration and withdrawal of the rejection of claim 83 under 35 U.S.C. § 102(e).

No Form PTO-892 Was Made Available to Applicants

The Office action states on page 7:

> The prior art made of record on form PTO-892 and not relied upon is considered pertinent to applicant's disclosure. Applicant is required under 37 C.F.R. § 1.111(c) to consider these references fully when responding to this action. The documents cited therein teach the method for determining forces for a haptic interface.

Applicants' representative did not receive a form PTO-892 in this case, nor does it appear that a form PTO-892 was entered in the Image File Wrapper that is available online via PAIR. Applicants respectfully request that if such a form exists, that a copy be forwarded to Applicants' representative so that it may be considered in response.

Applicants submit that this Amendment and Response is complete in light of the unavailability of the form PTO-892 referenced in the Office action, and Applicants request timely entry of this Amendment and Response. Applicants request that if any issue remains following entry of this Amendment and Response regarding references cited on a form PTO-892, that Applicants be given an opportunity to respond.

Conclusion

Applicants request that the Examiner reconsider and withdraw the standing objection and rejections in light of this Amendment and Response, and that the application be allowed. Applicants respectfully submit that all of pending claims 39-83 are in condition for allowance.

If the Examiner believes that it would be useful to discuss any aspect of the application by telephone, the undersigned representative cordially invites the Examiner to call at the telephone number given below.

Respectfully submitted,

Date: December 13, 2004
Reg. No. 53,002

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